Geographical analysis of economic impact of interlink of rivers in India

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Inter-linking Rivers, Irrigation, Hydroelectricity, Poverty, Aquaculture, Unemployment, Migration, Industries.

Abstract

Monsoonal and other weather prototypes in India can be widely rickety, epochal droughts, flood are patchy result widely increase the economic tribulations but have displaced millions of human lives. Monsoon while some areas have witnessed floods, other has witnessed a drought. The climatic conditions are responsible for variations in the regional pattern of economic activity in the area. As a result, there are marked regional disparities in various economic sectors. Basic purpose of the present study was to assess the impact of interlink of rivers in India on Indian economy. There is short- term as well as long-term economic impact on Indian economy. A systematic study of interlink of rivers was focused on important of linking different surplus rivers of the country with the deficient rivers so that the excess water of surplus region could be diverted, to deficient region. This would help in the great connotation for the enlargement of agriculture and activity, irrigation, hydroelectricity, industries etc. and generate the money from fishing activity; tourist places which can be developed on propose dam and reservoirs as well as mitigation of droughts, floods, poverty, and unemployment. The population increased from 36108800 in1951 to1210193422 in 2011. And the other hand agriculture in the total GDP has declined, facing the problem of water scarcity demand for food is growing, energy crises. Faster and better development of economic activity cannot be achieved without interlink of rivers. The major rationale behind interlink rivers is to provide 173billion cu. M of additional water to irrigate about 37 million hectares.

Introduction

The scarcity of water in western and peninsular India is highly burning issue. The low per capita availability of utilizable water, high spatial and chronological unpredictability of rainfall and the associated droughts and floods are other major factors. For a people drinking water in conflict, Indians have become increasingly one when it comes to sharing the dread of heir water scare future. On the other hand it is concern is a growing sense of popular disillusionment with the insufficiency and ennui of government in dealing with recurrent cycles of floods and drought occurring all at once in different parts of the country. The demand for water would grow in the future with and without appropriate policy intervention, including price of water for a specific purpose and laying down yardstick for efficiency of water use in specific sectors of the economy. The population of India is increasing very rapidly, result is the per capita water availability declined from 5.20 Th. cu. m per annum in 1950 to 1.80 Th. cu. m per annum in 2000. And by 2050, the per capita water availability in India is expected to fall from the present 1820 m3 to 1140 m3, far less than the water scarcity threshold of 1700 m3/ person as necessary for civilized living. One more observation is that the interstate inequality of water availability is extreme, too. The Ganga-Brahmaputra-Meghan basins, which cover one third of the total land area, are home to 44 percent of India's population but drain more than 60 percent of the country's water resources. In the contrast, the Krishna, Cauvery and Penner river basins and the easterly flowing rivers between Penner and Kanyakumari cover 16 percent of the

land area, have 17 percent of the population, but drain only 6 percent of India's water. In India's 19 major rivers basin, only 55 percent of total water resources are utilizable. As a result, more than 220 million people have per capita water supply below 1000m3/ per year, indicating sever regional water scarcities. This situation is very formidable for current and next generation. Indian agriculture is heavily dependent on the Monsoon as source of water. In some parts of India, the failure of the Monsoon result in water shortage and in below average crop yield. So some corrective method should be adopted as to store the surplus water that flowing the monsoon season as well as surplus water transfer is hypothesized both intra- and inter- basin levels. Solution can be constructed the dam in India is indispensable for the construction of excess monsoon flows to meet the growing demand region.

Objectives

The present paper had attempted to correlate the overall economic development and inter-link of rivers project for various states of India.

Study area

India has an area of 3,287,590 square kilometers with 9.6% water availability and total population of 1210193422 (2011 Census). It has extended from 6044'and 35030' North Latitudes and 6807'and 97025' East Longitudes. India shares land the boundary with Pakistan to the west, China, Nepal, and Bhutan to the south-east, and Burma and Bangladesh to the east. In the Indian Ocean, India is in the vicinity of Sri Lanka and Maldives; in addition India's Andaman and Nicobar Island share a maritime border with Thailand and Indonesia as well as the Indian Ocean on the south, the Arabian Sea on the south-west, and the Bay of Bengal on the south-east. It is the seventh largest country by area and the second- most populous country in the world. Major Himalayan- origin rivers that considerably flow through India include the Ganga and the Brahamputra, both of which drain into the Bay of Bengal. Important tributaries of the Ganga include the Yamuna and the Kosi the latter's extremely low gradient often leads to severing floods and course changes. Major peninsular rivers, whose steeper gradients prevent their waters from flooding, include the Godavari, the Mahanadi, the Kaveri and the Krishna, which also drain into the Bay of Bengal and the Narmada and the Tapi which drain into the Arabian Sea. India is a federation of 29 states and 7 union territories.

Database and Methodology

The present study is exclusively based on secondary data along with a literature review, Internet. Secondary data have been collected from Statistical Handbook, available of Gazetteers of different district, Directorate of Planning, Census Reports, NSSO various round, National and International journals, books, magazine. The collected information has been compiled and prepared the tables and maps. The analytical method has been implemented in the paper.

Explanation

Though the development of process initiated in India after independence has changed the production structure of the economy. Today India is facing a various natural, socio-economic problems such as floods, droughts, poverty, unemployment, farmer's suicide, etc. The development of the economy can be measured with the help of different criteria such as development of primary, secondary, tertiary, quaternary economic activity. The interlinking of river in India has been discussed for several decades now. Number of eminent engineers has seen this as an essential solution for the problem of water scarcity and mitigation of other natural and socio-economic problems in the country.

Distribution of water from one rivers system to another as clearly intended in any plan on interlinking rivers has to be seen in a much larger context as only a part of the total challenge of managing our water resources efficiently for a population that is growing rapidly and an economy that is expanding

Table **No. 1:**
Population 1951-2011

Sr. No.	Census Years	Population	Population grew by (%)
1	1951	361088000	-
2	1961	439235000	21.6
3	1971	548160000	24.8
4	1981	683329000	24.7
5	1991	846387888	23.9
6	2001	1028737436	21.5
7	2011	1210193422	17.6

As per the table no. 1, the population of India is increasing very rapidly from 1951 to 2011. Fact is that the population explosion is the root of all economic problems such as poverty, Unemployment, energy crisis, undeveloped nature of industries. Increasing population cannot be competed with inclusive the requirement of increasing demand of food grain, to overcome the energy crisis, development of industry etc. Faster growth in agriculture, irrigation, hydroelectricity, industrial development cannot be achieved without interlinking rivers. It is necessarily needed to look at every option by which the water problems of this country can be solved in an economically efficient manner.

Sir Arthur Cotton's plan in colonial times to link the southern rivers in 1839 was abandoned as railway took priority. The National Water Grid project by Dr. K.L. Rao an eminent water engineer who later became water resources minister, to link the Ganga and Cauvery- with a 2640 km canal to pump 25-billion cu.m height of 450m to irrigate 4 million hectare in the southern states was eventually scraped as it was very costly and lower cost alternatives were available. A third plan, the Garland canal, was proposed by the retired Captain Dastur. A luminary project, which though prima facie impractical, water problems have been proposed for more than 150 years.

River Links under the National Perspective Plan. Source: NWD

Peninsular component has 16 major canals with has four sub components. The en-route irrigation under the peninsular components is expected to irrigate substantial area proposed under the NRLP, which fall in arid and semi arid western and peninsular India. The quantity of water diverted in the peninsular component will be 141 cubic kilometers and in the Himalayan component 33 cubic kilometers. The estimated total power generated will be 34GW-4GW in the peninsular component and 30GW in Himalayan component. If and when completed, ILR will handle four times more water than the China's South to North water transfer project, itself one of the largest inter-basin water transfer projects implemented in the world.

Table **No.2:**

The Rivers Inter-linking feasibility reports completed by 2013, suggest the following potential economic impact.

Inter-link rivers project	New irrigation capacity added (hectares)	Potential electrical generation capacity (MW)	Drinking and industrial water added (Mm^3)
Krishna -Pennar Link	258334	42.5	56
Godavari -Krishna Link	287305	70	237
Parbati Kalisindhi Chamble	225992	17	89
Nagarjunasagar Somasila Link	168017	90	124
Ken Betwa Link	47000	72	2225
Sirsailam Pennar Link	187372	17	49
Damanganga Pinjal Link	-	-	44
Cavery - Vaigai - Gundar	337717	-	185
Polavaram -Vijayawada Link	314718	72	664
Mahanadi Godavari Link	363959	70	802
Par Tapi Narmada Link	169000	93	91
Pamba Achankovil Vaippar Link	91400	500	150

The average rainfall in India is about 4000 billion cubic meter of which annual surface water flow in the India is estimated at 1869 billion cubic meter of this reason , only about 960 million cubic meter of the available water can be utilized for irrigation, industries, drinking and ground water refill purpose. 80 percent of the water India receives its annual rains and surface water flow happens over a four month from June to September. This spatial and time inconsistency in the availability of natural water versus year's round demand for irrigation 140 million hectares. As drinking and industrial water creates a demand – supply gap that only worsens with India's raising population. As per the table no.2 ILR would help to crease the irrigation capacity, improve electricity generation capacity, availability of additional water for industrial and drinking water.

While construction of interlink of rivers project would create the temporary employments followed the high standards of living (short-term economic impact). Such construction sector would increase the demand of cement, clay, sand, bricks, coal tar products, electricity, gas, water supply, metal and metal products, and skill, semiskilled, unskilled labor force. The value-added of cement, clay products, and basic metal and metal products would increase by 2.46 percent, 2.37 percent, and 0.65 percent respectively. It would occurrence higher

growth of employment. Total employment would increase nearly by 0.91 percent. Due to the high income of the population their purchasing power would increase so in the economy the demand of more goods and services would increase by 0.91 percent.

Table **No.3:**

Estimated value of Annual Benefits of ILR project

Benefits	Quantity	Rate	Value of benefits (Rs. Crore)
Irrigation	30 million hectares	Rs. 17482 per hectare	52446
Power	24800MW	Rs. 1.67 per unit	414

The direct impact of ILR has been estimated, increasing the potential to irrigation 30 million hectares, net generation of hydroelectricity to the turn of 24800MW with MSTG and 19570 with JTF and 12000 million cubic meter of drinking water. On the other hand, the investment requirement for carrying out the project is estimated as Rs. 444331.2 crores (Rs. 434657.13 crore with JTF). This investment will be rolled out over's a period of ten years. The annual irrigation benefits that arise due to ILR are estimated as Rs. 17482 percent hectares of command area. The power generated is value at Rs. 1.67 per unit.

India has growing population this will increase demand for reliable source of food and improved agriculture yield- both of which, claims India's National Council of Applied Economic Research require significantly improve irrigation network than the current state.

In 2011, the service sector made up 55.6 percentage GDP, the industrial sector 26.2 percent and the agriculture sector 18.0 percent. Average an economic growth rate of 7.5 percent for several years prior to 2007. Agriculture despite experience a slowdown in growth and a decline in its share in GDP is still one of the major growth drivers. The important thing is that from the 54 years since 1950 the Indian economy grew by more than 7 percent in 12 years. Of this in nine years it was agriculture that was mainly responsible. Even more important thing until 2003-04, it was only in four years that the economic grew at more than 8 percent. The year from 1958-59 to 2005-06 of these years coincide with very high growth of the agriculture sector. In contrast industry and services have at best pulled up GDP growth to7.3 percent. When there was no significant contribution from the agriculture Irrigation is a crucial input for agriculture growth, for example, the Bhakra dam enables Punjab and Haryana to register faster growth and reduce sustainability. Irrigation intensity increased sustainability in two states through the dam- canal network. The addition irrigated areas have been of the order of 6-8 million hectares over 35 years. The production of rice and wheat in the Bhakra commanded area during 1996-97 was 8 time of production in 1960-61.

India 64 percent of cultivation land is dependent on Monsoon , the economic significance of irrigation in India is namely to reduce over dependent on Monsoon, advanced agricultural productivity, bringing more land under cultivation, reducing instability output levels, creation of job opportunities, hydroelectricity, and cheap transport facility. It will happen through ILR only.

If India manages to realize its irrigation potential, land will be irrigated, leaving just a quarter dependent on Monsoon rain. There is need new reservoir to raise storage capacity to 450 billion cubic meters from the current 250 billion cubic meters. Once the construction of this ILRP is over, the gain to the economy would in the form of increase and assures irrigation, the growth

irrigation benefits in India is 15.7 million hectares. The envisaged additional area to be irrigated by the ILRP is nearly 40 percent of the current irrigation area. A number of mining and industrial projects have been stuck in quagmire of legal and environmental procedure due to water scarcity.

Analogous by sustainable economic growth and rise income level, India is balanced to face connotation increase in energy demand in the next few decades which also translates into higher demand for electricity. The gap between electricity demand and supply situation is highlighted by the fact that the country experienced a peak deficit of 5.2 percent considering an energy elasticity of 0.82. India is projected to require around 7 percent annual growth in electricity supply to sustain a GDP growth of around 8.5 percent p.a. over the next few years. This requires would complete by hydroelectricity potential source to address the deficit and meet the demand growth for acceleration economic growth development.

Apart from increased irrigation, link canals have the potential to generate hydroelectricity, which during summer is low, once the canals and reservoirs are in place and enough water is stored in reservoirs it can be used to generate hydroelectricity. The ILRP with the MSTG link is envisaged to generate 28994.5MW of power and require 4193MW of power for the project, resulting in net power generating of 24801.5MW. The JTF link is envisaged to generate 24822.5 MW of power and require 5252MW of power for project resulting in net power generation of 19570.5MW. Bhakra Beas Management Board, illustrate state owned enterprises in north India has an installed capacity of 2.9GW and generates 12000-14000 million units per year. The cost of generation of energy after four decades of operation is about 20 paisa/kWh. BBMB is a major source of peak power and black start to the northern grid in India. Large reservoirs provide operational flexibility. BBMB reservoirs annually supply water for irrigation to12.5 million acres of agricultural land of partner states, enabling northern India in its green revolution

ILR is also very important for horizontal and vertical expansion of aquaculture, with total production increasing from 0.37 million tons in 1980 to 4.43 million tons during 2012-13 and increase of over 12 fold. Fish farming though a part time activity contributes a major share of the income of these fish farming, ranging from 14.98 percent in Orissa, to95.26 percent in Andhra Pradesh, with an average of 76.66 percent with the new area coming under culture in the states of Punjab and Haryana due to dam availability. Fresh water aquaculture resources of the country have been estimated of the order of 13.67 million hectares India's fresh water resources consist of rivers and canals reservoirs (3.15 million ha.) ponds and tanks (235 million ha.). Describe India as sleeping giants the inland capture fish production has increased from 192000 tons in 1950 to781846 tons in 2001 and it has increased 90.40 lakh tons in 2012-13 there was 2.34 percent rise in the inland fish products. It means India's fish production has been showing a marginal increased to every year. If ILR implemented, the fresh water fishing production would increase. After the construction of Bhakra dam and Govind Sagar, the large number of the local population are catching the fish in per month for the local

As per NSSO 66th Round 2009-10, Publication:-Nov. 2011 rural employment proportion is 41 percent. As per 2011 census about 33.7 crore and 13.7 crore people are working in rural India and urban India respectively. Total population in this year of 2011 was 83.3million in rural areas and 37.7 million in urban population. Unemployment rate was showing an increasing trend since 2011 when it was 3.5 percent. The same rose to 3.6 percent in 2012 and climbed to 3.7 percent last year. This year, the jobless rate expected to rise to 3.8 percent according to the report 'Global Employment Trend 2014'. According to the International Labour Organization report, it has been argued that India was experiencing 'Jobless growth' due to the fact that total employment grew by only 1.1 million from 2004-05 to 2009-10 (based on the National Sample

Survey), representing an employment elasticity of almost zero. Again it is confined to a few Monsoon months in the year. This accounts for uncertainty in agriculture employment. To remove this uncertainty additional irrigation facility in the form of minor and major irrigation project should be provided so that the farmers may adopt multiple cropping patterns and remain busy throughout the year. In Indian rural society, agriculture is the only means of employment. However, most of the rural people an engaged directly as well as indirectly in agricultural operatio0n. But, agriculture in India is basically a seasonal affair. It provides employment facilities to the rural people only in a particular season of the year for example during the sowing and harvesting period people are fully employed and the period between the post harvest and before the next sowing they remain unemployed. It has adversely affected their standard of living.

In India migration spurred primarily by employment help shape the economic life of India's population. The growing rate of rural to urban migration is an increasing number of people do not find sufficient economic opportunities in rural areas and move instead to towns and cities. As per NSS the migration rate in urban areas at 35 percent because rural India is still characterized by agrarian distress, a chronic lack of employment, and farmer suicides. Thus the urban rural divide has been one of the primary reasons for India's labour mobility.

The World Bank estimated that the current industries water use in India is about 13 percent of the total fresh water withdrawal in the country and the water demand for industrial uses and energy production will grow at a rate of 4.2 percent per year, rising from 67 billion cubic meters in 1999 to 228 billion cubic meters by 2025. All these estimates reveal that the industrial water demand is not negligible in India, and that is bound to grow in the coming years. So the solution is an implementation of ILRP.

In 2010, 29.8 percent of all Indians lived below the national poverty line, while 33.8 percent of rural Indians lived below the national poverty line, according to World Bank data. ILRP is capable of increase food grain production growth by additional 2 percent without ILRP food grain production is expected to be 305.66 million tons. But it would expect to touch 393.88 million tons with MSTG link and 393.70million tons with JFT link.

Concluding remark

ILRP is aimed at linking different surplus rivers of the country with the deficient rivers so that the excess water from surplus region could be diverted to deficient region. This would help in increasing irrigation intensity in the country, increasing water availability for drinking and industries' purpose, mitigation effect of drought and floods to a certain extent. Once the dams and reservoirs are constructed, and water is stored, hydroelectricity could be generated; generation during summers, ample storage at dams or reservoirs could increase efficiency of hydroelectric power plants. Impact of ILRP is in the growth of the services sector supplying crucial inputs to the construction sector. Direct gain of ILRP would agriculture and agriculture households, the entire economy would benefit because of increase agriculture production. Government should be thought about ILR with considering the conservation of bio-diversity and natural resources.

References

Ansari, Nasim (1968), *Economics of Irrigation Rates –– A Study in Punjab and Uttar Pradesh,* Asia Publishing House.

Government of India (1972), 'Report of the Irrigation Commission', New Delhi.

GOI (2005b): *Employment and Unemployment Situation in India: January-June,* 2004, Government of India, National Sample Survey Organisation, Report No. 506.

Papola, T.S. (1992): 'The Question of Unemployment', in Bimal Jalan (ed.) *The Indian Economy: Problems and Prospects,* New Delhi, Viking, Penguin Books India (P) Ltd

Acharya, Sarthi, (1989), Agricultural Wages in India : A Disaggregated Analysis, *Indian Journal of Agricultural Economics,* Vol. 44, No.2, April – June.

Bhagat, R.B. (2008). "Assessing the Measurement of Internal Migration in India", *Asia and Pacific Migration Journal,* 17(1), 91-102.

Chandra. B., *The Rise and Growth of Economic Nationalism in India,* New Delhi 1966

"*Fishery and Aquaculture Country Profiles: India*". Food and Agriculture Organization of the United Nations. 2011.

Unemployment levels rising in India: Experts. (n.d.). Retrieved from http://zeenews.india.com/business/news/economy/unemployment-levels-rising-in-india-experts_93289.htm

Suresh Chand Aggarwal and Surender Kumar - IDFC ... (n.d.). Retrieved from http://www.idfc.com/pdf/report/2011/Chp-18-Industrial-Water-Demand-in-India-Challenges.pdf

Economic impact of interlinking of rivers programme - India ... (n.d.). Retrieved from http://www.indiaenvironmentportal.org.in/content/262410/economic-impact-of-interlinking-of-rivers-programme/